No. 08-17389

IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT

LUIS SANCHO and WALTER L. WAGNER,
Plaintiffs-Appellants,

v.

UNITED STATES DEPARTMENT OF ENERGY, ET AL.,
Defendants-Appellees

ON APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF HAWAII

BRIEF *AMICUS CURIAE* OF SHELDON GLASHOW, FRANK WILCZEK AND RICHARD WILSON IN SUPPORT OF FEDERAL APPELLEES

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PRELIMINARY STATEMENT and INTEREST OF *AMICI*

Amici are physicists who have specialized in nuclear particle physics for most of their distinguished careers. Two of them have been awarded the Nobel Prize in Physics for their contributions to the understanding of elementary atomic and sub-atomic particles; the third holds and has held endowed chairs in physics at Harvard University, was chairman and is currently a member of the Harvard Cyclotron Operating Committee, and is an expert in, and has published extensively on, the subjects of high energy physics, radiation physics, nuclear safety and risk analysis.

Amici have special knowledge which they believe will assist the Court in this case. Moreover, *amici* are concerned that Appellants have misunderstood, misconstrued and misstated the import of *amici*'s submission to the district court, and have misrepresented that submission as supporting Appellants' claims. *Amici* wish to inform the Court of the correct scientific approach to the issues of safety raised in this case.

This case involves a challenge to the United States' financial support for the construction of the Large Hadron Collider ("LHC"), a subatomic particle accelerator straddling the French-Swiss border near Geneva, Switzerland, and research to be conducted there. The core of plaintiffs' complaint alleges that the United States and other defendants violated the National Environmental Policy Act by failing to prepare an adequate environmental analysis of the risks of several theoretical objects that

plaintiffs allege could be produced by the Collider. Plaintiffs' central "factual" allegation is that the collisions at CERN's LHC are unsafe and could potentially result in the destruction of the Earth. Complaint ¶ 13, SER 4; *see also* Order Granting Federal Defendants' Motion to Dismiss at SER 117.

Similar claims of potentially cataclysmic disasters were made by one of the plaintiffs in this case when the Relativistic Heavy Ion Collider (RHIC) was planned, constructed, and began operation at Brookhaven National Laboratory on Long Island, New York State. One of the *amici* was a member of the high level committee selected to analyze the potential risks of the RHIC, and the other two *amici* published an article on the risks associated with the RHIC in *Nature*, one of the most prestigious scientific journals, prior to the commencement of operations of the RHIC. In fact, the RHIC has been fully operation for almost ten years without incident.

Amici are aware that the LHC has undergone thorough scientific safety and risk analyses, and are familiar with the numerous scientific papers examining the risks associated with the LHC. These scientific papers have examined, *inter alia*, the very claims asserted by Appellants here. Appellants' claims have not been accepted by the scientific community and are not based on rigorous scientific analysis.

Other than the purely speculative "disaster" plaintiffs recited in the Complaint, they do not allege any injury that is particularized, nor do they assert any claim with sufficient geographical nexus to the United States. *Amici* seek to submit their brief

in support of the federal Defendants-Appellees' argument that Appellants' allegations of injury are speculative are not scientifically credible because they are based on purely hypothetical occurrences which do not pose a safety risk.

Amici are concerned about the use of litigation based on misinformation about and misunderstanding of science under the guise of concern for the environment that inhibits vital and important scientific inquiry. *Amici* are prompted to submit this brief in part because the Appellants have misconstrued and misrepresented the nature of science and scientific knowledge, and have misused and misconstrued our *amicus* brief in the district court to support their fallacious arguments in this Court. The substance of this brief is the same as our *amicus* brief filed in this case in the United States District Court for the District of Hawaii, with the addition of clarification with respect to the nature of scientific inquiry and discourse.

ARGUMENT

I.

APPELLANTS' ALLEGATIONS OF A SAFETY RISK AT CERN AND INJURY TO THEM ARE PURELY HYPOTHETICAL, SPECULATIVE, AND NOT CREDIBLE

In the district court, the federal defendants asserted, *inter alia*, that the Appellants do not have standing because the alleged injury to them is speculative and not credible. *Amici* agree that the complaint and affidavits filed by the Plaintiffs-Appellants in this case are without merit.

Scientists who have proposed the construction and operation of the collider known as Large Hadron Collider ("LHC") at CERN are aware of problems associated with quantitatively assessing the risks involved with this novel project. This is not a new problem and virtually every new significant activity must face it. Instead of ending the pursuit of significant scientific endeavors, the scientific community has developed processes to identify all imaginable events that may lead to adverse effects and use the best available information and scientific talent to mitigate them. No other procedure has been suggested by any professional society, any government or international organization. *Amici* contend that the Appellants' suppositions are without merit, and cannot be the basis of a particularized injury sufficient to confer standing.

Until half a century ago, industrial safety was managed by learning from past mishaps and by using appropriate measures to avoid their recurrence. For example, miners once used caged canaries as methane detectors. This management process is no longer acceptable as modern technologies have sometimes led to disasters, such as Union Carbide in Bhopal, India, so large and severe that people now demand proof-in-principle that such disasters cannot happen. Society wants to avoid failures at nuclear power reactors and chemical plants. So the old protocol for risk avoidance - try it once; if it turns out to be dangerous, modify the technology, or don't do it again - is no longer acceptable.

In the case before this Court, one important question is whether the LHC at CERN is sufficiently understood that we can be confident that it will not cause a catastrophe of cosmic dimensions, as Appellants claim. *Amici* assert that the question has been asked and studied by many of the world's best scientists and they have concluded that not only has a scientifically acceptable procedure been followed but that we ***do*** know enough to respond to the safety requirements.

During the early 1970s a process was developed to assess the safety of new technologies such as nuclear electric power plants, large oil refineries, large chemical plants, liquefied natural gas facilities, and other large and technically complex facilities. The process consists of a group of qualified individuals first imagining the worst types of catastrophic failures that could occur at the facility and then designing

a system to reduce the probability of such failure occurring and reducing the potential consequences of a failure to an acceptable level. This process (often called "fault tree analysis" or "FTA" or "event tree analysis" or "ETA") has been adopted by the nuclear, chemical, and oil industries and by government agencies such as the U.S. Nuclear Regulatory Commission and NASA.[1, 2]

The *amici* recognize that a new procedure had to be developed for the concerns at issue in this case. It has been claimed that the new particle accelerator could trigger an irreversible process that would have enormous consequences, including the destruction of the Earth. This is not a new concern – for example, scientists working on the Manhattan Project in the 1940s seriously considered whether a nuclear explosion could release enough energy to ignite the Earth's atmosphere. At that time, probabilistic risk assessment, as it is known today, did not yet exist. The Manhattan Project scientists used then existing knowledge and concluded that the catastrophe postulated would not happen, and history has proven them right.

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[1] *See* U.S. Nuclear Regulatory Commission Fault Tree Handbook (NUREG-0492), http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0492/sr0492.pdf, last accessed 04/09/09; NASA, Fault Tree Handbook with Aerospace Applications (2002), http://www.hq.nasa.gov/office/codeq/doctree/fthb.pdf, last accessed 04/09/09.

[2] An example is the Electric Power Research Institute's CAFTA software, which is used by many of the U.S. nuclear power plants, by a majority of U.S. and international aerospace manufacturers, and by the U.S. Government to evaluate the safety and reliability of nuclear reactors, the Space Shuttle, and the International Space Station.

Concerns about the LHC at CERN are legitimate and are properly raised. In fact, they have been raised, studied, and answered decisively by scientists in the United States and in Europe. But the revival of the concern by the Appellants in this case is not well-founded, or even legitimate, because they have, apparently, not educated themselves about the extensive analysis that has been done and the published literature widely available on the subject.

This is not the first such new particle accelerator, or the first such study of risks, or the first reassurance of the safety of a powerful particle accelerator. The closest analogy is the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory on Long Island in New York State, where beams of highly charged gold or lead atoms (the heavy ions) traveling at "relativistic speeds" (approaching the speed of light – 99.95% of light speed) sped in opposite directions around circular racetracks before colliding. RHIC truly is an atom smasher: it creates nucleus-to-nucleus impacts, taking place thousands of times per second, each impact producing thousands of secondary particles. These incredibly complex "events" are recorded by sophisticated detectors and analyzed by supercomputers and a world-wide network of smaller computers. The Brookhaven RHIC studies matter at densities and temperatures never seen before in the laboratory; on a small scale, it reproduces the extreme conditions that existed in the early universe, conditions under which the constituents of ordinary matter are expected to be liberated as quark-gluon plasma.

Physicists had long speculated about this state of matter, but RHIC allowed them to glimpse it. About nine years ago, a doomsday vision similar to the one put forward here by Appellants was advanced relating to the RHIC.[3]

One of the *amici*, Frank Wilczek, in the July 2000 issue of *Scientific American*[4] described the concern. The procedure that was followed was important and a good example for the future. The director of Brookhaven National Laboratory established a blue ribbon panel of independent experts (including Wilczek himself) to investigate the subject. The most creative scientists were tasked to imagine what might go wrong and satisfy themselves that the imagined problems did not exist. They examined carefully three scientifically conceivable disaster scenarios in which experiments might produce "black holes" that could gradually consume the Earth; or could create

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[3] One of the plaintiffs in this case, Walter L. Wagner, brought suits in 1999 and 2000 in the Northern District of California and in the Eastern District of New York to enjoin operation of the RHIC at the Brookhaven National Laboratory. *Wagner v. U.S. Dep't of Energy*, Case No. C99-2226 MMC (N.D. Cal. May 14, 1999) and *Wagner v. Brookhaven Science Associates, LLC.*, Civ. No. 00-1656 (S.D.N.Y. March 3, 2000). Both lawsuits were dismissed (*See* Exs. J, items 66 and 67 (N.D. Cal. Docket Sheet) and H (E.D.N.Y. Order, 5/26/2000) annexed to the federal Defendants' motion to dismiss in the district court, SER 146). In neither of these cases did the courts give any credence to Wagner's theories about the types of dangerous effects that plaintiffs here claim would result from subatomic particle collisions. This Court should reject Appellants' similar challenges in this case and dismiss their claims.

[4] Wilczek, F., Letter to the Editor on the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory, 281 *Scientific American* (July 8, 1999). Prof. Wilczek's letter was a reply to Walter L. Wagner's letter "Black holes at Brookhaven?" which appeared in the same issue of *Scientific American*.

a "vacuum instability" that could expand catastrophically in all directions at the speed of light; or might produce "strangelets," a kind of "strange matter" that would grow to incorporate ordinary matter, perhaps transforming the entire Earth into its form. The first two issues have been raised, and dismissed, each time a new particle accelerator opens. Using similar arguments, Jaffe, *et al.* were able to conclude that neither posed any threat at RHIC.[8] There is no chance at all that RHIC could manufacture a black hole or gravitational singularity. Even if RHIC (or its higher energy successors) could create a black hole, such a black hole would be so tiny that it would evaporate instantly.[9, 10]

In the natural world, relativistic heavy ions in the form of cosmic rays have been in RHIC-like collisions with one another in space for eons (more, in fact, than will ever take place at RHIC). These distant collisions do not make RHIC experimentally less useful, because (unlike at RHIC) they cannot be directly studied, but one fact is clear: cosmic ray collisions in space have not led to the creation of a

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[8] Jaffe, R. L., Busza, W., Wilczek, F., and Sandweiss, J., "Review of Speculative 'Disaster Scenarios' at RHIC," 72 *Rev. Mod. Phys.* 1125-1140 (2000).

[9] *See* Blaizot, J.-P, Iliopoulos, J., Madsen, J., Ross, G.G., Sonderegger, P., and Specht, H.-J., Study of Potentially Dangerous Events During Heavy-ion Collisions at the LHC: Report of the LHC Safety Study Group. Report CERN 2003-001 (CERN 2003) (SER 59-64).

[10] Previous studies had also argued against a vacuum instability, but could not quite rule it out.

new vacuum, so we breathe easily. The third concern arose from the fact that RHIC accelerates heavy ions rather than individual elementary particles, and must be considered more carefully. Such careful consideration was given in studies by Jaffe, *et al.* and by Dar, *et al.*[11] Both groups included theorists who were among the first to speculate that lumps of strange matter called strangelets, which contain many strange quarks as well as the usual up and down quarks that make up atomic nuclei, might be more stable than ordinary matter. The strangelet disaster scenario described by Glashow and Wilson[12] would only be credible if strangelets exist (which is conceivable), and if they form reasonably stable lumps (which is unlikely), and if they are negatively charged (unlikely given that current theory strongly favors positive charges), and if tiny strangelets can be created at RHIC (which was and is exceedingly unlikely); in fact it has not occurred in the several years that RHIC has been operational.[13, 14] The RHIC was approved, and it has run successfully, with no sign whatever of the problems described above.

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[11] Dar, A., De Rujula, A., and Heinz, U., "Will Relativistic Heavy-ion Colliders Destroy Our Planet?" 470 *Phys. Lett. B* 142-148 (1999).

[12] Glashow, S.L. and Wilson, R., "Taking Serious Risks Seriously," 402 *Nature* 596-597 (1999).

[13] The RHIC White Papers, 757 *Nucl. Phys. A* 1 (2005).

[14] *See* Blaizot, J.-P*, et al., supra*, n. 9.

Plaintiffs alleged that by causing the collision of subatomic particles, the LHC could create dangerous objects that they describe as "strangelets," "micro black holes," and "magnetic monopoles" that allegedly might destroy the planet. The LHC is in many ways very much simpler than the RHIC. The LHC primarily accelerates and causes the collision of elementary particles -- protons. Only a small proportion of its use involves collision of nuclei. Although the LHC operates at a much higher energy level than the RHIC, the likelihood of any of the postulated catastrophes envisaged by the most imaginative physicists is much smaller than with a nuclear collider.

The CERN management followed the example set by Brookhaven National Laboratory and commissioned a high level independent committee (the LHC Safety Study Group or LSSG) to imagine what could go wrong. This committee reported its conclusions in 2003.[15] It found the likelihood of the kinds of events postulated by the Appellants to be insignificant. In particular, the probability that "strangelets" exist at LHC is even smaller than at RHIC, and, as noted above, there are no signs whatever that "strangelets" have been created at RHIC. Their work was reviewed by

[15] *See* Blaizot, J.-P*, et al., supra*, n. 9.

the LHC Safety Assessment Group (or LSAG), which very recently studied actual operations of the LHC and confirmed that no such events have in fact occurred.[16]

An even more recent paper by Koch, B., Bleicher, M., and Stöcker, H., Exclusion of Black Hole Disaster Scenarios at the LHC, arXiv:0807.3349v [hep-ph] (September 28, 2008) (available at http://arxiv.org/PS_cache/arxiv/pdf/0807/0807.3349v1.pdf, last accessed 04/09/09) addresses "fear in the public, that the conjectured production of mini black holes might lead to a dangerous chain reaction" and "summarize[s] the most straight forward proofs that are necessary to rule out such doomsday scenarios." The authors conclude that "none of the physically sensible paths . . . can lead to a black hole disaster at the LHC." *Id*. at 7. This paper, in turn, builds on a paper by Giddings, S.B., and Mangano, M.L., Astrophysical Implications of Hypothetical Stable TeV-scale Black Holes, arXiv:0806.3381v2 [hep-ph] (September 23, 2008) (available at http://arXiv.org/pdf/0806.3381, last accessed 04/09/09), which analyzed "macroscopic effects of TeV-scale black holes, such as could possibly be produced at the LHC, in what is regarded as an extremely hypothetical scenario in which they are stable and, if trapped inside Earth, begin to

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[16] Ellis, J., Giudice, G., Mangano, M., Tkachev, I., and Wiedemann, U., "Review of the Safety of LHC Collisions" http://lsag.web.cern.ch/lsag/LSAG-Report.pdf, last accessed 04/09/09 (SER 66-71) and CERN Scientific Policy Committee, "SPC Report on LSAG Documents," http://indico.cern.ch/getFile.py/access?contribId=20&resId=0&materialId=0&confId=35065, last accessed 04/09/09 (SER 73-74).

accrete matter. . .basing the resulting accretion models on first-principles, basic, and well-tested physical laws. " The study "finds no basis for concerns that TeV-scale black holes from the LHC could pose a risk to Earth on time scales shorter than the Earth's natural lifetime. Indeed, conservative arguments based on detailed calculations and the best-available scientific knowledge, including solid astronomical data, conclude, from multiple perspectives, that there is no risk of any significance whatsoever from such black holes."

II.

APPELLANTS' ARGUMENT THAT *AMICI*'S CONCLUSION THAT A CATASTROPHIC EVENT AT THE LHC IS "UNLIKELY" SUPPORTS PLAINTIFFS' CLAIMS IS BASED ON A FUNDAMENTAL MISUNDERSTANDING OF THE NATURE OF SCIENCE

Appellants argue that: "Merely being 'unlikely' or 'very unlikely' that the LHC will create conditions that destroy Earth is *every reason not to proceed with the experiment* unless and until it can be proven to be **impossible** to destroy the Earth." (Appellants' Brief at 11 (emphasis supplied)). Appellants' proposed standard, that for something to be safe experts must conclude that an accident is "impossible", betrays Appellants' fundamental misunderstanding of the nature of science.

As Nobel laureate in Physics Richard Feynman put it, "Scientists, therefore, are used to dealing with doubt and uncertainty. All scientific knowledge is uncertain. This experience with doubt and uncertainty is important. I believe that it is of very

great value, and one that extends beyond the sciences. I believe that to solve any problem that has never been solved before, you have to leave the door to the unknown ajar. You have to permit the possibility that you do not have it exactly right. Otherwise, if you have made up your mind already, you might not solve it." Feynman, R. P. *The Meaning of It All: Thoughts of a Citizen-Scientist* 26-27 (1999).

The Supreme Court has recognized that "it would be unreasonable to conclude that the subject of scientific testimony must be 'known' to a certainty; arguably, there are no certainties in science. See, e.g., Brief for Nicolaas Bloembergen et al. as Amici Curiae at 9 ('Indeed, scientists do not assert that they know what is immutably 'true'--they are committed to searching for new, temporary theories to explain, as best they can, phenomena')." *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 590 (1993) (footnote omitted). As the Bloembergen *amici* went on to explain: "in science accepted 'truth' is not a constant . . . it evolves, either gradually or discontinuously. . . . An hypothesis can be falsified or disproved, but cannot, ultimately, be proven true because knowledge is always incomplete. An hypothesis that is tested and not falsified is corroborated, but not proved. Thus, scientific statements or theories are never final and are always subject to revision or rejection. *See* L. Loevinger, "Standards of Proof in Science and Law", 32 *Jurimetrics J.* 327 (1992). . . ." Brief of *Amici Curiae* Nicolaas Bloembergen, *et al.* at 12-13, filed in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), 1993 WL

13006286 (January 19, 1993); *see also* L. Loevinger, "The Distinctive Functions of Science and Law," 24 *Interdisciplinary Science Reviews* 87 (1999). "Even the most robust and reliable theory, however, is tentative. A scientific theory is forever subject to reexamination and -- as in the case of Ptolemaic astronomy --may ultimately be rejected after centuries of viability." Brief of 72 Nobel Laureates and Others, filed in *Edwards v. Aguillard*, 482 U.S. 578 (1987), 1986 WL 727658 (August 18, 1986).[17]

Appellants note that *amici* are not "absolutely certain" that there is no risk and they imply that our views should therefore be disregarded. As scientists, we would be abusing the meaning of "absolute" or "certainty" if we had written that there was no chance of any event occurring in the future, because there is nothing absolutely certain about our understanding of the future. To claim that something is "absolutely safe" is incorrect usage and we studiously declined to play this word game in our brief to the district court or in this brief to this Court.

However, we are content to tell this Court, as we did the district court, that the issue of the safety of the LHC has been properly raised by its proponents. It has been

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[17] Indeed, the ancient motto of the Royal Society of London for the Improvement of Natural Knowledge (commonly known as the "Royal Society"), founded in 1663 and probably the earliest society for the advancement of scientific knowledge, is "*Nullius in Verba*," which has been translated by the renowned physicist Freeman Dyson (in 55 New York Review of Books, Number 10 (June 12, 2008)) as "Nobody's word is final," signifying a commitment to knowledge through experiment rather than through dogma or doctrine.

extensively examined and discussed by many of the brightest minds that have addressed the issue. The particular concerns raised by the Appellants are not correct.

Amici believe that the procedure for addressing the safety issue was proper and followed and follows the highest standards scientists have yet developed. Whereas we do not say that it is "absolutely safe," we have no qualms about endorsing the operation of the LHC to our colleagues, our friends, to this Court, and to the world.

CONCLUSION

Amici consider that the operation of the LHC is safe, not only in the old sense of that word, but in the more general sense that our most qualified scientists have thoroughly considered and analyzed the risks involved in the operation of the LHC.

Appellants' claims are merely hypothetical and speculative, and contradicted by much evidence and scientific analysis. The appeal should be dismissed.

Dated: Larchmont, New York
April 10, 2009

Respectfully submitted,

s/ Martin S. Kaufman

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BIOGRAPHICAL ADDENDUM

SHELDON LEE GLASHOW is a Nobel Laureate in Physics. He is Arthur G.B. Metcalf Professor of Physics at Boston University. Previously he was the Higgins Professor of Physics and Mellon Professor of the Sciences at Harvard University, and. He is a fellow of the American Physical Society and the American Association for the Advancement of Science; member of the American Academy of Arts and Sciences, the National Academy of Sciences, and the American Philosophical Society; foreign member of the Russian and Korean Academies of Science; and founding editor of Quantum Magazine. He is the recipient of many awards, including the Oppenheimer Medal, the Richtmyer Lecture Award, and the Erice Science for Peace Prize.

FRANK WILCZEK is a theoretical physicist and Nobel Laureate in Physics. He is currently the Herman Feshbach Professor of Physics at the Massachusetts Institute of Technology. Wilczek along with H. David Politzer and David Gross were awarded the Nobel Prize in Physics in 2004 for their discovery of asymptotic freedom in the theory of the strong interaction. His current research interests include "pure" particle physics: connections between theoretical ideas and observable phenomena; quantum theory of black holes; behavior of matter – the phase structure of quark matter at ultra-high temperature and density; "color" superconductivity; the application of particle physics to cosmology; and the application of field theory techniques to condensed matter physics.

RICHARD WILSON is Mallinckrodt Research Professor of Physics at Harvard University and immediate past Director of the Regional Center for Global Environmental Change at Harvard University. Professor Wilson is a past Chairman of the Department of Physics at Harvard University, a past chairman and currently a member of the Cyclotron Operating Committee. He is an Affiliate of the Center for Science and International Affairs and the Center for Middle Eastern Studies at Harvard University. He is a founder of the Society for Risk Analysis. He is and has been a consultant to the United States government and the governments of numerous foreign countries on matters of nuclear safety, toxicology, epidemiology, public health and safety, and risk assessment. Professor Wilson's areas of expertise include elementary particle physics, radiation physics, chemical carcinogens, air pollution, ground water pollution by arsenic, and human rights. He is the author of many articles on high energy physics, environmental pollution and risk analysis, including PARTICLES IN OUR AIR, EXPOSURES AND HEALTH EFFECTS (with Editor John Daniel Spengler) (Harvard University Center for Risk Analysis, 1986) and RISK-BENEFIT

ANALYSIS (with Edmund A. C. Crouch) (Harvard University Center for Risk Analysis, 2nd ed. 2001). Professor Wilson is the author or co-author of more than 880 published papers on subjects including atomic particles, radioactive particle decay, shielding of particle accelerators and nuclear reactors, nuclear energy production, health risks of nuclear power plant accidents, risks and health impacts of radiation, risks of nuclear proliferation, health effects of electromagnetic fields, acute toxicity and carcinogenic risk, carcinogenicity bioassays, statistical distributions of health risks, public health, cancer risk management, risk benefit analysis, and global energy use and global warming. He is the recipient of numerous awards, including the Forum Award, of the American Physical Society for Forum on Science and Society in 1990 for "[O]utstanding research and promotion of public understanding of a broad spectrum of issues dealing with physics, the environment, and public health, including his work on reactor safety, estimation of risks posed by environmental pollution and pioneering use of comparative risk analysis" and the Presidential Citation of the American Nuclear Society in 2008 for "[M]entoring students for over 50 years in nuclear science, engineering and technology and his tireless efforts promoting peaceful application of nuclear power. . . . Through over 900 papers and publications, and myriad lectures, he has provided invaluable insight and wisdom giving the nuclear community a profound legacy from which to draw knowledge."

CERTIFICATE OF COMPLIANCE

Pursuant to Fed. R. App. P. 29(d) and 9th Cir. R. 32-1, I certify that the foregoing Brief for the *Amici Curiae* is proportionately spaced, has a typeface of 14 points, and contains 4,454 words, including the Biographical Addendum, but excluding the cover, the Table of Contents, and the Table of Authorities, determined using the word count feature of WordPerfect 13, the software application used to prepare the brief.

Dated: Larchmont, New York
April 10, 2009

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CERTIFICATE OF SERVICE

I hereby certify that on April 13, 2009, I electronically filed the foregoing Brief *Amicus Curiae* with the Clerk of the Court for the United States Court of Appeals for the Ninth Circuit by using the appellate CM/ECF system. Participants in the case who are registered CM/ECF users will be served by the appellate CM/ECF system.

I further certify that some of the participants in this case are not registered CM/ECF users. I have on April 10, 2009 mailed the foregoing Brief *Amicus Curiae* by First Class Mail, postage prepaid, to the following non-CM/ECF participants:

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